SAMSUNG

GSM TELEPHONE
SGH-X430

SERVICE Manual

GSM TELEPHONE

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ELECTRONICS

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BASIC.

1. SGH-X430 Specification

1. GSM General Specification

	GSM900 Phase 1	EGSM 900 Phase 2	DCS1800 Phase 1
Freq. Band[MHz] Uplink/Downlink	890~915 935~960	880~915 925~960	1710~1785 1805~1880
ARFCN range	1~124	0~124 & 975~1023	512~885
Tx/Rx spacing	45MHz	45MHz	95MHz
Mod. Bit rate/ Bit Period	270.833kbps 3.692us	270.833kbps 3.692us	270.833kbps 3.692us
Time Slot Period/Frame Period	576.9us 4.615ms	576.9us 4.615ms	576.9us 4.615ms
Modulation	0.3GMSK	0.3GMSK	0.3GMSK
MS Power	33dBm~13dBm	33dBm~5dBm	30dBm~0dBm
Power Class	5pcl ~ 15pcl	5pcl ~ 19pcl	0pcl ~ 15pcl
Sensitivity	-102dBm	-102dBm	-100dBm
TDMA Mux	8	8	8
Cell Radius	35Km	35Km	2Km

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2. GSM TX power class

TX Power control level	GSM900
5	33±2 dBm
6	31±2 dBm
7	29±2 dBm
8	27±2 dBm
9	25±2 dBm
10	23±2 dBm
11	21±2 dBm
12	19±2 dBm
13	17±2 dBm
14	15±2 dBm
15	13±2 dBm
16	11±3 dBm
17	9±3dBm
18	7±3 dBm
19	5±3 dBm

TX Power control level	DCS1800
0	30±3 dBm
1	28±3 dBm
2	26±3 dBm
3	24±3 dBm
4	22±3 dBm
5	20±3 dBm
6	18±3 dBm
7	16±3 dBm
8	14±3 dBm
9	12±4 dBm
10	10±4 dBm
11	8±4dBm
12	6±4 dBm
13	4±4 dBm
14	2±5 dBm
15	0±5 dBm

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2. SGH-X430 Circuit Description

1. SGH-X430 RF Circuit Description

1) RX PART

1. ASM(U201)
   ⇨ Switching Tx, Rx path for GSM900, DCS1800 by logic controlling.

2. ASM Control Logic (U501, U502)
   ⇨ Truth Table

	VC1	VC2
GSM Tx Mode	L	H
DCS Tx Mode	H	L
GSM / DCS Rx Mode	L	L

3. FILTER
   To convert Electromagnetic Field Wave to Acoustic Wave and then pass the specific frequency band.

   - GSM FILTER (F100)
     ⇨ For filtering the frequency band between 925 ~ 960 MHz

   - DCS FILTER (F101)
     ⇨ For filtering the frequency band 1805 and 1880 MHz.

4. VCTCXO (OSC100)

   To generate the 13MHz reference clock to drive the logic and RF.
   After additional process, the reference clock is applied to the U100 Rx IQ demodulator and Tx IQ modulator.
   The oscillator for RX IQ demodulator and Tx modulator are controlled by serial data to select channel and use fast lock mode for GPRS high class operation.

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5. Si 4205 (U100)

This chip integrates three differential-input LNAs.
The GSM input supports the E-GSM, DCS input supports the DCS1800, PCS input supports the PCS1900. The LNA inputs are matched to the 200 ohm differential output SAW filters through eternal LC matching network.
Image-reject mixer downconverts the RF signal to a 100 KHz intermediate frequency(IF) with the RFLO from SI4133T frequency synthesizer.
The RFLO frequency is between 1737.8 ~ 1989.9 MHz.
The Mixer output is amplified with an analog programmable gain amplifier(PGA), which is controlled by AGAIN.
The quadrature IF signal is digitized with high resolution A/D converts (ADC).

The SI4205 down-converts the ADC output to baseband with a digital 100 KHz quadrature LO signal.
Digital decimation and IIR filters perform channel selection to remove blocking and reference interface signals. After channel selection, the digital output is scaled with a digital PGA, which is controlled with the DGAIN. DACs drive a differential analog signal onto the RXIP, RXIN, RXQP, RXQN pins to interface to standard analog-input baseband IC.

2) TX PART

Baseband IQ signal fed into offset PLL, this function is included inside of U100 chip.
SI4205 chip generates modulator signal which power level is about 1.5dBm and fed into Power Amplifier(U200).
The PA output power and power ramping are well controlled by Auto Power Control circuit. We use offset PLL below,

Modulation Spectrum	200kHz offset 30 kHz bandwidth	GSM	-35dBc
		DCS	-35dBc
		PCS	-35dBc
	400kHz offset 30 kHz bandwidth	GSM	-66dBc
		DCS	-65dBc
		PCS	-66dBc
	600kHz ~ 1.8MHz offset 30 kHz bandwidth	GSM	-75dBc
		DCS	-68dBc
		PCS	-75dBc

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2. Baseband Circuit description of SGH-X430

1) PSC2106

1. Power Management

Seven low-dropout regulators designed specifically for GSM applications power the terminal and help ensure optimal system performance and long battery life.
A programmable LDO provides support for 1.8V, 3.0V SIMs, while a self-resetting, electronically fused switch supplies power to external accessories. Ancillary support functions, such as two LED drivers and two call-alert drivers, aid in reducing both board area and system complexity.
A four-wire serial interface unit(SIU) provides access to control and configuration registers. This interface gives a microprocessor full control of the PSC2106 and enables system designers to maximize both standby and talk times. Error reporting is provided via an interrupt signal and status register.
Supervisory functions. including a reset generator, an input voltage monitor, and a thermal monitor, support reliable system design. These functions work together to ensure proper system behavior during start-up or in the event of a fault condition(low microprocessor voltage, insufficient battery energy, or excessive die temperature).

2. Battery Charge Management

A battery charge management block, incorporating an internal PMOS switch, and an 8-bit ADC, provides fast, efficient charging of single-cell Li-Ion battery. Used in conjunction with a current-limited voltage source, this block safely conditions near-dead cells and provides the option of having fast-charge and top-off controlled internally or by the system's microprocessor.

3. Backlight LED Driver

The backlight LED driver is a low-side, programmable current source designed to control the brightness of the keyboard and LCD illumination. LED1_DRV is controlled via LED1_[0:2] and can be programmed to sink from 15mA to 60mA in 7.5mA steps. LED2_DRV is controlled via LED2_ [0:2] and can be programmed to sink from 5mA to 40mA in 5mA steps. Both LED drivers are capable of sinking their maximum output current at a worst-case maximum output voltage of 0.6V. For efficient use, the LEDs is connected between the battery and the LED_DRV output.

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4. Vibrator Motor Driver

The vibrator motor driver is a low-side, programmable voltage source designed to drive a small dc motor that silently alerts the user of an incoming call. The driver is controlled by VIB[0:1] and can be programmed to maintain a motor voltage of 1.3V, 2.0V, or 2.5V(relative to V_{BAT}) while sinking up to 100mA. For efficient use, the vibrator motor should be connected between the main battery and the VIB_DRV output.

2) Connector

1. LCD Connector

LCD is consisted of main LCD(color 65K UFB LCD). Chip select signals of EMI part in the trident, CLCD_EN, can enable main LCD. LED_EN signal enables white LED of main LCD and EL_EN signal enables dimming mode of main LCD.
These two signals are from IO part of the DSP in the trident. RST signal from 2106 initiates the initial process of the LCD.
16-bit data lines(D(0)~D(15)) transfers data and commands to LCD through emi_filter. Data and commands use A(2) signal. If this signal is high, Inputs to LCD are commands. If it is low, Inputs to LCD are data. The signal which informs the input or output state to LCD, is required. But this system is not necessary this signal. So CP_WEN signal is used to write data or commands to LCD.
Power signals for LCD are +VBATT and VCCD.
SPK1P and SPK1N from CSP1093 are used for audio speaker. And YMU_VIB_EN from MA-3 enables the motor.

2. JTAG Connector

Trident has two JTAG ports which are for ARM core and DSP core(DSP16000). So this system has two port connector for these ports. Pins' initials for ARM core are 'CP_' and pins' initials for DSP core are 'DSP_'.
CP_TDI and DSP_TDI signal are used for input of data. CP_TDO and DSP_TDO signals are used for the output of the data. CP_TCK and DSP_TCK signals are used for clock because JTAG communication is a synchronous. CP_TMS and DSP_TMS signals are test mode signals. The difference between these is the RESET_INT signal which is for ARM core RESET.

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3. Keypad connector

This is consisted of key interface pins in the trident, KEY_ROW[0~4] and KEY_COL[0~4]. These signals compose the matrix. Result of matrix informs the key status to key interface in the trident. Some pins are connected to varistor for ESD protection. And power on/off key is seperated from the matrix.
So power on/off signal is connected with PSC2106 to enable PSC2106.
SVC_GREEN, SVC_RED and SVC_BLUE are from OCTL of CSP1093.
These signals decide the color of LED, service indicator.
Nine key LED use the +VBATT supply voltage. These are connected to BACKLIGHT signal in the PSC2106.
This signal enables LEDs with current control. FLIP_SNS informs the status of folder (open or closed) to the trident. This uses the hall effect IC, A3210ELH.
A magnet under main LCD enables A3210ELH which is on the main PCB.

4. EMI Filtering

This system uses the EMI Filter to reduce noise from LCD part. Some control signals are connected to LCD without EMI filtering.

3) IF connetor

It is 23-pin connector, and uses 18-pin at present. They are designed to use SDS, DEBUG, DLC-DETECT, JIG_ON, VEXT, VTEST, VF, +VBATT and GND. They connected to power supply IC, microprocessor and signal processor IC.

4) Audio

AOUTAP, AOUTAN from CSP1093 is connected to the speaker via analog switch. AOUTBP and AOUTBN are connected to the ear-mic speaker via ear-jack. MICIN and MICOUT are connected to the main MIC. And AUXIN and AUXOUT are connected to the Ear-mic.
YMU762MA3 is a LSI for portable telephone that is capable of playing high quality music by utilizing FM synthesizer and ADPCM decorder that are included in this device.
As a synthesis, YMU762MA3 is equipped 16 voices with differenttones. Since the device is capable of simultaneously generating up to synchronous with the play of the FM synthesizer, various sampled voices can be used as sound effects.

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Since the play data of YMU762MA3 are interpreted at anytime through FIFO, the length of the data(playing period) is not limited, so the device can flexiblysupport application such as incoming call melody music distribution service. The hardware sequencer built in this device allows playing of the complex music without giving excessive load to the CPU of the portable telephones. Moreover, the registers of the FM synthesizer can be operated directly for real time sound generation, allowing, for example, utilization of various sound effects when using the game software installed in the portable telephone.
YMU762 includes a speaker amplifier with high ripple removal rate whose maximum output is 550mW (SPVDD=3.6V). The device is also equipped with conventional function including a vibartor and a circuit for controlling LEDs synchornous with music.
For the headphone, it is provided with a stereophonic output terminal.
For the purpose of enabling YMU762MA3 to demonstarte its full capablities, Yamaha purpose to use "SMAF:Synthetic music Mobile Application Format" as a data distribution format that is compatible wiht multimedia. Since the SMAF takes a structure that sets importance on the synchronization between sound and images, various contents can be written into it including incoming call melody with words that can be used for traning karaoke, and commercial channel that combines texts, images and sounds, and others. The hardware sequencer of YMU762MA3 directly interprets and plays blocks relevant to systhesis (playing music and reproducing ADPCM with FM synthesizer) that are included in data distributed in SMAF.

5) Memory

This system uses SHARP's memory, LRS1828.
It is consisted of 128M bits flash memory and 32M bits SCRAM. It has 16 bit data line, D[0~15] which is connected to trident, LCD or CSP1093. It has 22 bit address lines, A[1~22]. They are connected too. CP_CSROMEN and CO_CSROM2EN signals, chip select signals in the trident enable two memories. They use 3 volt supply voltage, VCCD.
During wrting process, CP_WEN is low and it enables writing process to flash memory and SCRAM. During reading process, CP_OEN is low and it output information which is located at the address from the trident in the flash memory or SCRAM to data lines. Each chip select signals in the trident select memory among 2 flash memory and SCRAM. Reading or writing procedure is processed after CP_WEN or CP_OEN is enabled. Memories use FLASH_RESET, which is buffered signal of RESET from PSC2106, for ESD protection. A[0] signal enables lower byte of SCRAM and UPPER_BYTE signal enables higher byte of SCRAM.

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6) Trident

Trident is consisted of ARM core and DSP core. It has 20K*16bits RAM 144K*16bits ROM in the DSP. It has 4K*32bits ROM and 2K*32bits RAM in the ARM core. DSP is consisted of timer, one bit input/output unit(BIO), JTAG, EMI and HDS(Hardware Development System). ARM core is consisted of EMI, PIC(Programmable Interrupt Controller), reset/power/clock unit, DMA controller, TIC(Test Interface Controller), peripheral bridge, PPI, SSI(Synchronous Serial Interface), ACCs(Asynchronous communications controllers), timer, ADC, RTC(Real-Time Clock) and keyboard interface.
DSP_AB[0~8], address lines of DSP core and DSP_DB[0~15], data lines of DSP core are connected to CSP1093. A[0~20], address lines of ARM core and D[0~15], data lines of ARM core are connected to memory, LCD and YMU762. ICP(Interprocessor Communication Port) controls the communication between ARM core and DSP core.
CSROMEN, CSRAMEN and CS1N to CS4N in the ARM core are connected to each memory. WEN and OEN control the process of memory. External IRQ(Interrupt ReQuest) signals from each units, such as, YMU, Ear-jack, Ear-mic and CSP1093, need the compatible process.
Some PPI pins has many special functions. CP_KB[0~9] receive the status from key FPCB and are used for the communicatios using data link cable(DEBUG_DTR/RTS/TXD/RXD/CTS/DSR).
And UP_CS/SCLK/SDI, control signals for PSC2106 are outputted through PPI pins. It has signal port for charging(CHG_DET), SIM_RESET and FLIP_SNS with which we knows open.closed status of folder. It has JTAG control pins(TDI/TDO/TCK) for ARM core and DSP core. It recieves 13MHz clock in CKI pin from external TCXO and receives 32.768KHz clock from X1RTC. ADC(Analog to Digital Convertor) part receives the status of temperature, battery type and battery voltage. And control signals(DSP_INT, DSP_IO and DSP_RWN) for DSP core are used. It enables main LCD with DSP IP pins.

7) CSP1093

CSP1093 integrates the timing and control functions for GSM 2+ mobile application with the ADC and DAC functions. The CSP1093 interfaces to the trident, via a 16-bit parallel interface. It serves as the interface that connects a DSP to the RF circuitry in a GSM 2+ mobile telephone. DSP can load 148 bits of burst data into CSP1093's internal register, and program CSP1093's event timing and control register with the exact time to send the burst. When the timing portion of the event timing and control register matches the internal quarter-bit counter and internal frame counter, the 148 bits in the internal

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register are GMSK modulated according to GSM 2+ standards. The resulting phase information is translated into I and Q differential output voltages that can be connected directly to an RF modulator at the TXOP and TXON pins. The DSP is notified when the transmission is completed. For receiving baseband data, a DSP can program CSP1093 s event timing and control register with the exact time to start receiving I and Q samples through TXIP and TXIN pins. When that time is reached, the control portion of the event timing and control register will start the baseband receive section converting I and Q sample pairs. The samples are stored in a double-buffered register until the register contains 32 sample pairs. CSP1093 then notifies the DSP which has ample time to read the information out before the next 32 sample pairs are stored. The voice band ADC converter issues an interrupt to the DSP whenever it finishes converting a 16-bit PCM word. The DSP then reads the new input sample and simultaneously loads the voice band output DAC converter with a new PCM output word. The voice band output can be connected directly to a speaker via AOUTAN and AOUTAP pins and be connected to a Ear-mic speaker via AOUTBN and AOUTBP pins.

8) X-TAL(13MHz)

This system uses the 13MHz TCXO, TCO-9141B, Toyocom. AFC control signal form CSP1093 controls frequency from 13MHz x-tal. It generates the clock frequency. This clock is fed to CSP1093,Trident,YMU762 and Silab solution.

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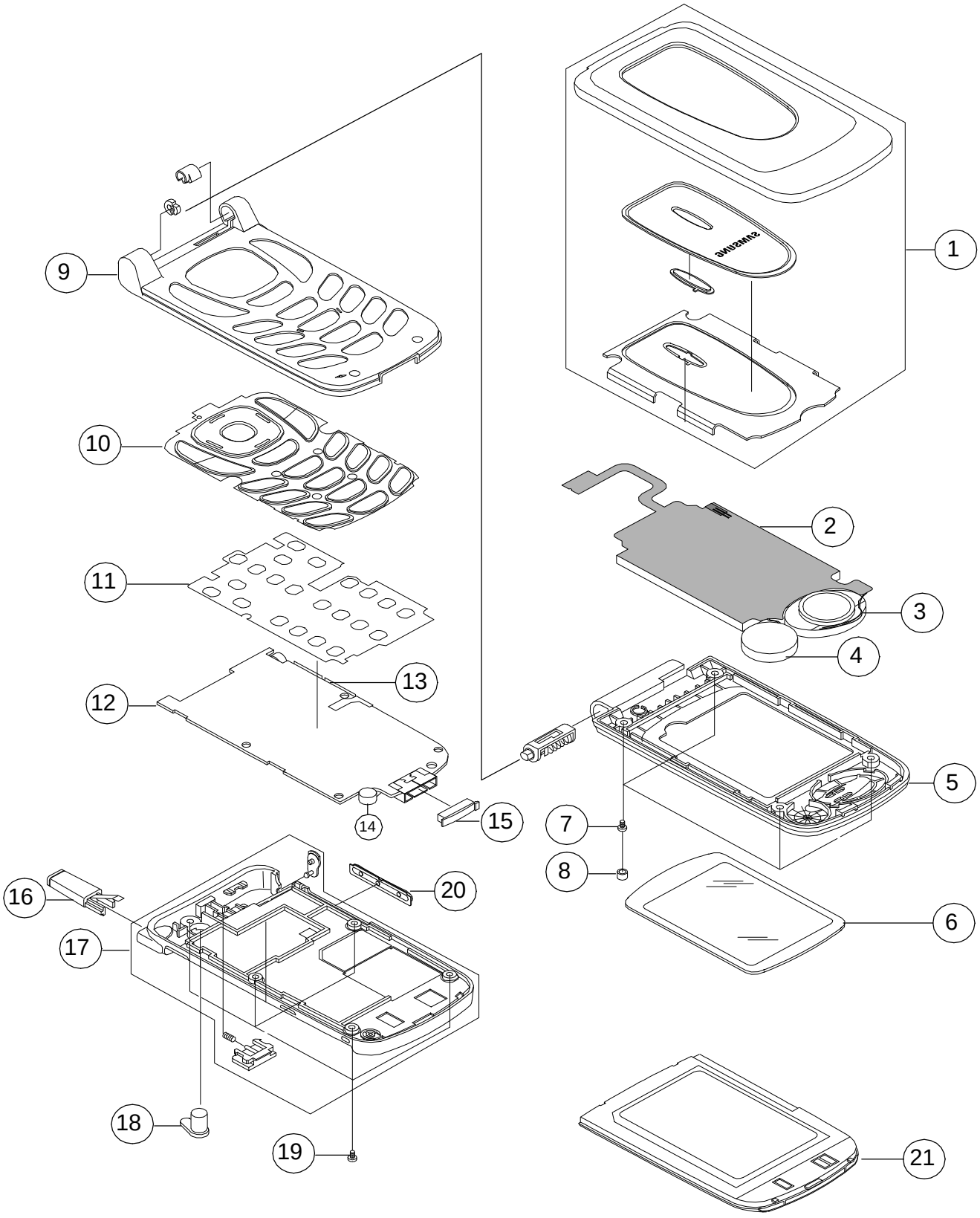
3. SGH-X430 Exploded View and its Parts list

1. Cellular phone Exploded View



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2. Cellular phone Parts list

Location NO.		Description	SEC CODE	Remark
1		FOLDER UPPER	GH75-03664B	
2		LCD	GH07-00410A	
3		SPEAKER	3001-001448	
4		MOTOR	GH31-00067A	
5		FOLDER LOWER	GH75-03669A	
6		WINDOW LCD	GH75-03666A	
7		SCREW	6001-001478	
8		FOLDER SCREW CAP	GH73-02274A	
9		FRONT COVER	GH75-03663A	
10		KEYPAD	GH75-03668A	
11		DOME SHEET	GH59-00931A	
12		MAIN PBA	GH92-01606A	
13		VOLKEY FPCB	GH59-00934A	
14		MIC	GH30-00054A	
15		IF COVER	GH73-01331A	
16		ANTENNA	GH42-00341C	
17		REAR COVER	GH75-03385B	
18		RF COVER	GH73-02490B	
19		SCREW	6001-001479	
20		SIDE KEY	GH72-08862A	
21		BATTERY	GH43-01070B	

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3. Test Jig (GH80-00865A)

3-1. RF Test Cable
(GH39-00182A)

3-2. Test Cable
(GH39-00127A)

3-3. Serial Cable

3-4. Power Supply Cable

3-5. DATA CABLE
(GH39-00159A)

3-6. TA
(GH44-00482A)

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4. SGH-X430 MAIN Electrical Parts List

Design LOC	SEC CODE
ZD800	0406-001083
ZD801	0406-001083
Q1000	0501-000225
Q300	0504-000168
U501	0504-001151
U502	0504-001151
D900	0601-001094
D901	0601-001094
D902	0601-001094
D903	0601-001094
D904	0601-001094
D905	0601-001094
D906	0601-001094
D907	0601-001094
D908	0601-001094
SW900	1009-001010
U600	1109-001274
U300	1203-002902
U1000	1204-001960
U500	1204-001984
U401	1209-001219
V805	1405-001018
V1000	1405-001082
V1001	1405-001082
V1002	1405-001082
V1003	1405-001082
V700	1405-001082
V702	1405-001082
V703	1405-001082
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V705	1405-001082
V706	1405-001082
V800	1405-001082
V801	1405-001082
V802	1405-001082
V803	1405-001082
V804	1405-001082
V808	1405-001082
V903	1405-001082
V904	1405-001082
V905	1405-001082
V907	1405-001082

Design LOC	SEC CODE
V908	1405-001082
V909	1405-001082
V910	1405-001082
V911	1405-001082
V806	1405-001093
V900	1405-001112
V901	1405-001112
V902	1405-001112
R103	2007-000138
R211	2007-000138
R1018	2007-000140
R802	2007-000140
R803	2007-000140
R804	2007-000140
R805	2007-000140
R806	2007-000140
R811	2007-000140
R1009	2007-000141
R1011	2007-000141
R1006	2007-000148
R1012	2007-000148
R1019	2007-000148
R305	2007-000157
R400	2007-000157
R402	2007-000157
R800	2007-000157
R801	2007-000157
R808	2007-000157
R1021	2007-000159
R1000	2007-000162
R1003	2007-000162
R1008	2007-000162
R1014	2007-000162
R504	2007-000162
R505	2007-000162
R910	2007-000162
R304	2007-000167
R401	2007-000170
R1013	2007-000171
R1016	2007-000171
R105	2007-000171
R204	2007-000171

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4. SGH-X430 MAIN Electrical Parts List

Design LOC	SEC CODE
R214	2007-000171
R302	2007-000171
R310	2007-000171
R501	2007-000171
R600	2007-000171
R807	2007-000171
R809	2007-000171
R911	2007-000171
R1001	2007-000172
R1002	2007-000172
R101	2007-000172
R300	2007-000172
R407	2007-000172
R601	2007-000172
R700	2007-000172
R810	2007-000566
R303	2007-000758
R1004	2007-000775
R1005	2007-000775
R1010	2007-001119
R102	2007-001308
R1007	2007-001325
R1017	2007-001333
R100	2007-002797
R900	2007-007009
R901	2007-007009
R902	2007-007009
R903	2007-007009
R904	2007-007009
R905	2007-007009
R906	2007-007009
R907	2007-007009
R908	2007-007009
R405	2007-007107
R301	2007-007137
R306	2007-007142
R403	2007-007142
R502	2007-007200
R503	2007-007200
R404	2007-007308
R406	2007-007308
R223	2007-000171

Design LOC	SEC CODE
R224	2007-000171
R308	2007-008263
C1005	2203-000233
C1028	2203-000233
C1030	2203-000233
C108	2203-000233
C110	2203-000233
C111	2203-000233
C112	2203-000233
C113	2203-000233
C313	2203-000233
C324	2203-000233
C602	2203-000233
C708	2203-000233
C801	2203-000233
C117	2203-000254
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C515	2203-000254
C604	2203-000254
C700	2203-000254
C104	2203-000278

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4. SGH-X430 MAIN Electrical Parts List

Design LOC	SEC CODE
C1023	2203-000330
C1011	2203-000386
C115	2203-000386
C209	2203-000386
C1014	2203-000438
C1021	2203-000438
C1022	2203-000438
C707	2203-000438
C1006	2203-000585
C100	2203-000628
C414	2203-000628
C416	2203-000628
C406	2203-000679
C1012	2203-000812
C1019	2203-000812
C225	2203-000812
C227	2203-000812
C303	2203-000812
C304	2203-000812
C305	2203-000812
C501	2203-000812
C507	2203-000812
C710	2203-000812
C711	2203-000812
C1013	2203-000885
C203	2203-000995
C1010	2203-001072
C503	2203-001153
C1020	2203-001239
C1008	2203-001259
C408	2203-001405
C116	2203-001412
C301	2203-001598
C307	2203-001598
C308	2203-001598
C309	2203-001598
C310	2203-001598
C311	2203-001598
C312	2203-001598
C315	2203-001598
C316	2203-001598
C903	2203-001598

Design LOC	SEC CODE
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C102	2203-005050
C103	2203-005050
C518	2203-005052
C1001	2203-005061
C1002	2203-005061
C1003	2203-005061
C1007	2203-005061
C1015	2203-005061
C300	2203-005061
C302	2203-005061
C405	2203-005061
C415	2203-005061
C418	2203-005061
C506	2203-005061
C600	2203-005061
C601	2203-005061
C1009	2203-005065
C1018	2203-005065
C504	2203-005065
C105	2203-005234
C107	2203-005234
C208	2203-005393
C106	2203-005450
C519	2203-005450
C224	2203-005482
C322	2203-005482
C701	2203-005482
C702	2203-005482
C715	2203-005482
C900	2203-005482
C901	2203-005482
C109	2203-005496
C223	2203-005496
C226	2203-005496
C404	2203-005496
C413	2203-005496
C505	2203-005496
C703	2203-005509
C902	2203-006053
C323	2203-006105
C306	2203-006257

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4. SGH-X430 MAIN Electrical Parts List

Design LOC	SEC CODE
C202	2404-001020
C318	2404-001105
C200	2404-001134
C1016	2404-001305
C1004	2404-001268
C319	2404-001268
C800	2404-001268
C705	2503-001041
C706	2503-001041
L209	2703-002202
L102	2703-002203
L210	2703-002203
L105	2703-002205
L204	2703-002207
L205	2703-002207
L106	2703-002365
L103	2703-002484
L100	2703-002485
OSC400	2801-003747
OSC100	2809-001260
F100	2904-001417
F101	2904-001419
U201	2909-001197
CON1	3705-001287
CN300	3709-001244
CN700	3711-005078
CN1000	3722-001715
M300	4302-001130
U400	GH09-00023A

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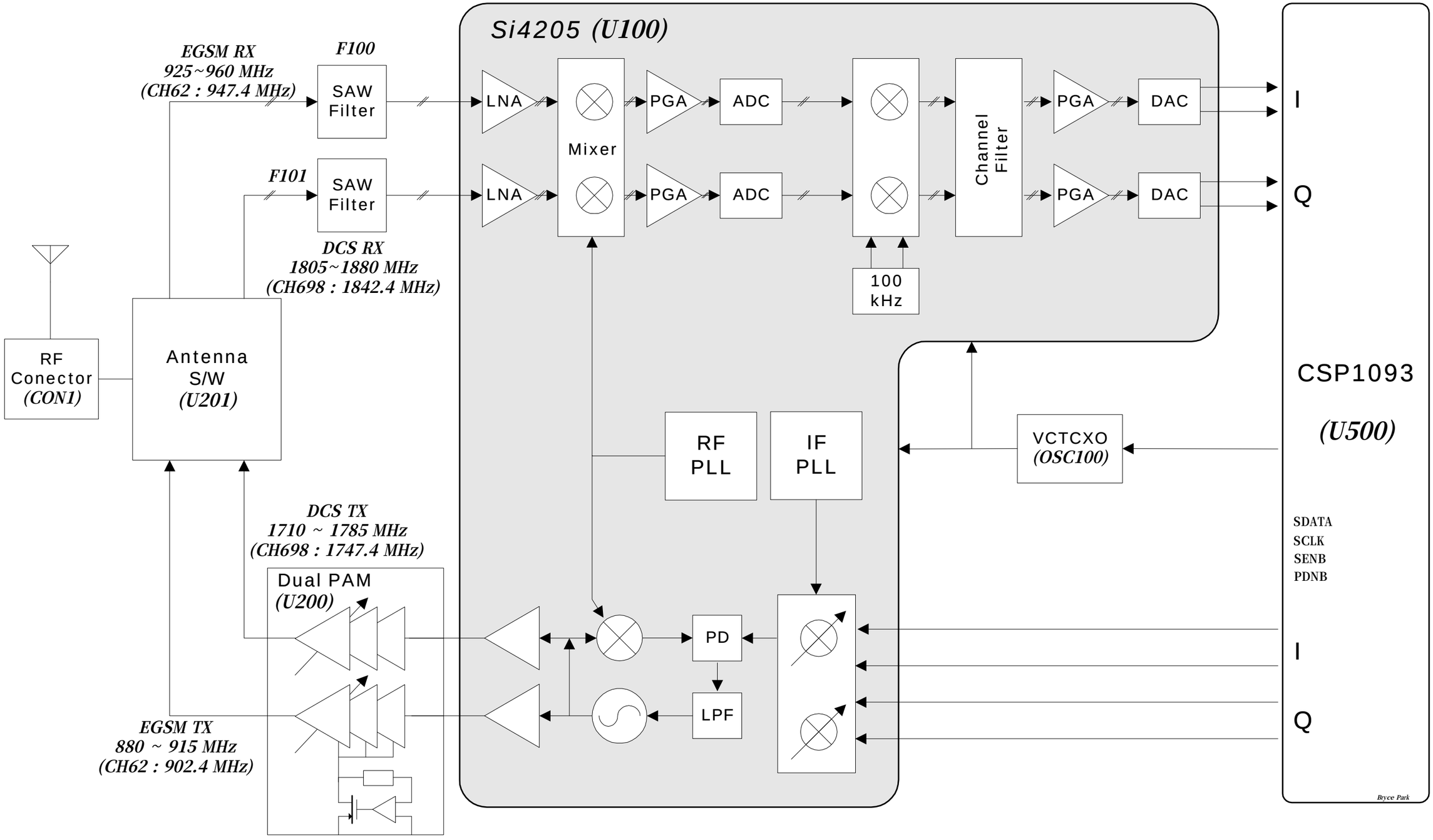
5. SGH-X430 Block Diagrams

1. RF Solution Block Diagram



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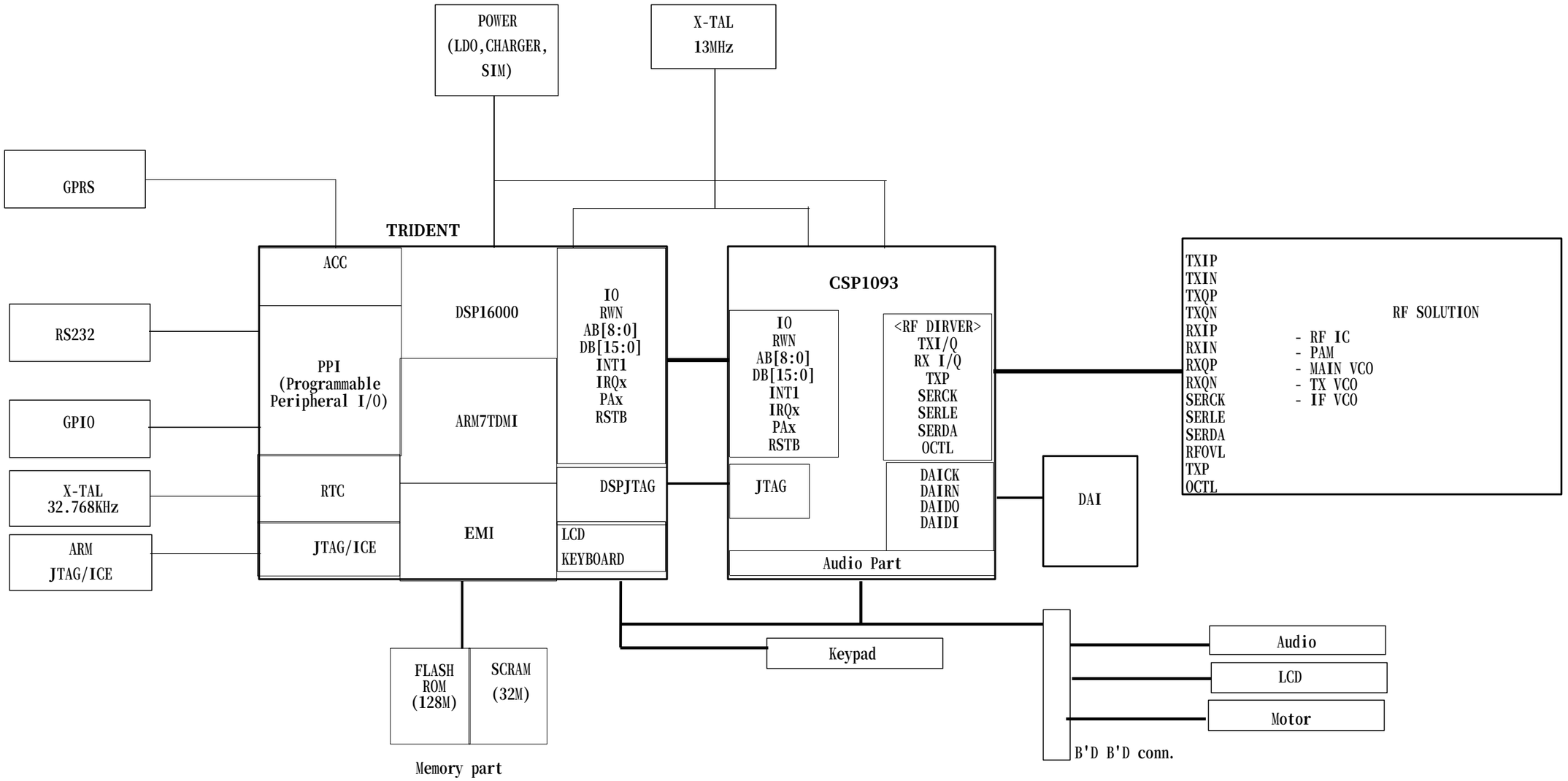
2. Base Band Solution Block Diagram



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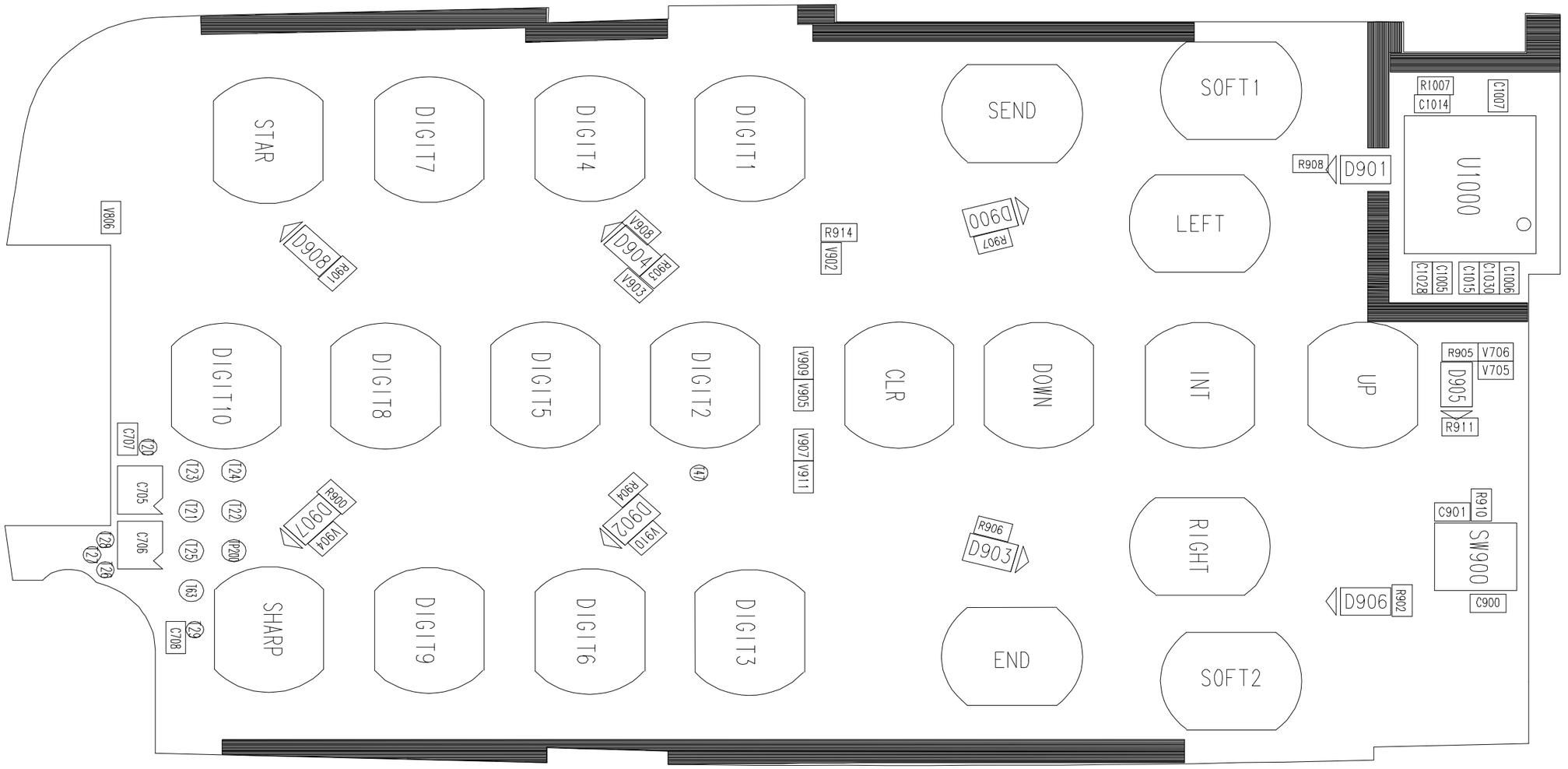
6. SGH-X430 PCB Diagrams

1. Main PCB Top Diagram



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2. Main PCB Bottom Diagram

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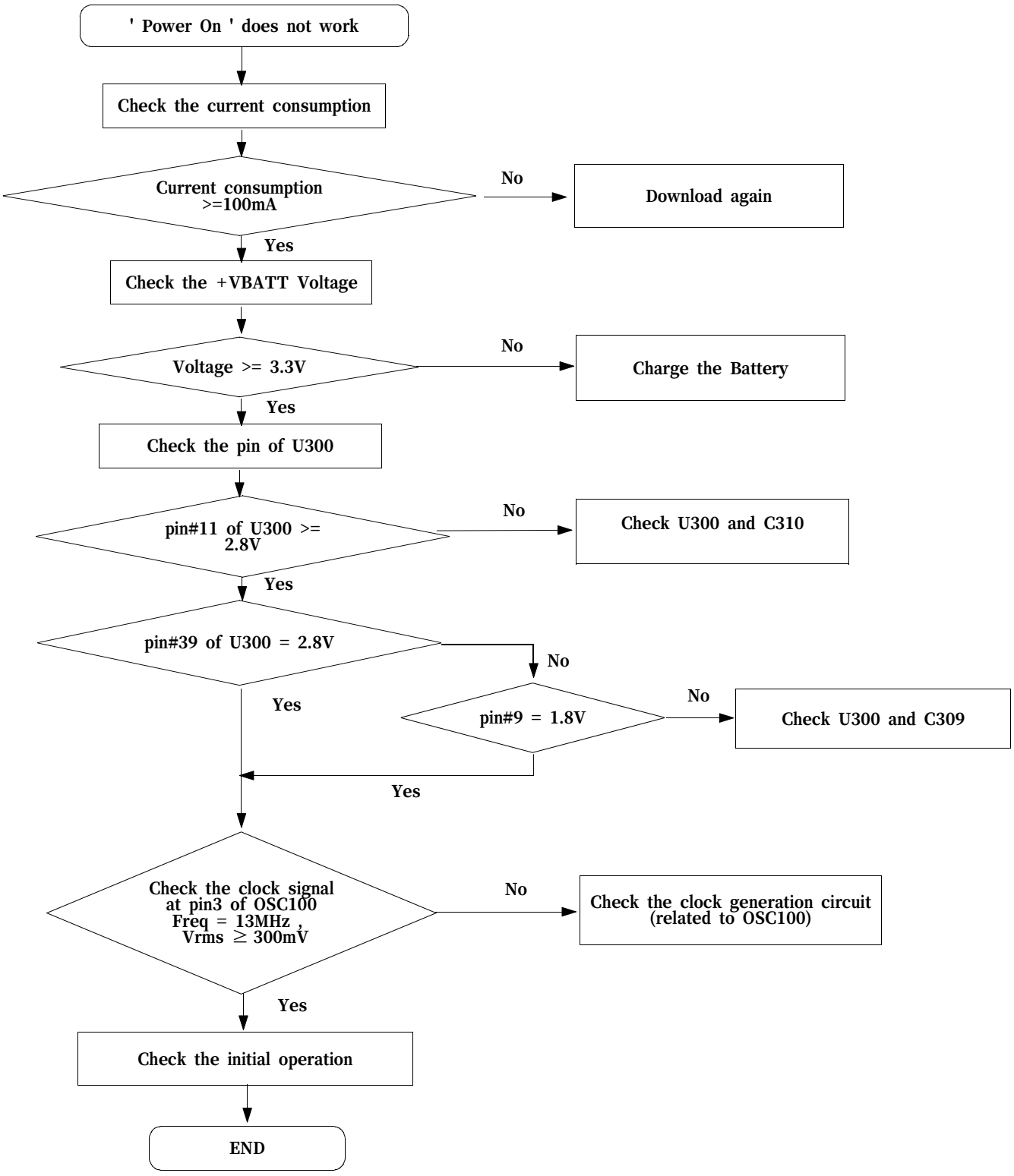
7. SGH-X430 Flow Chart of Troubleshooting

1. Power On



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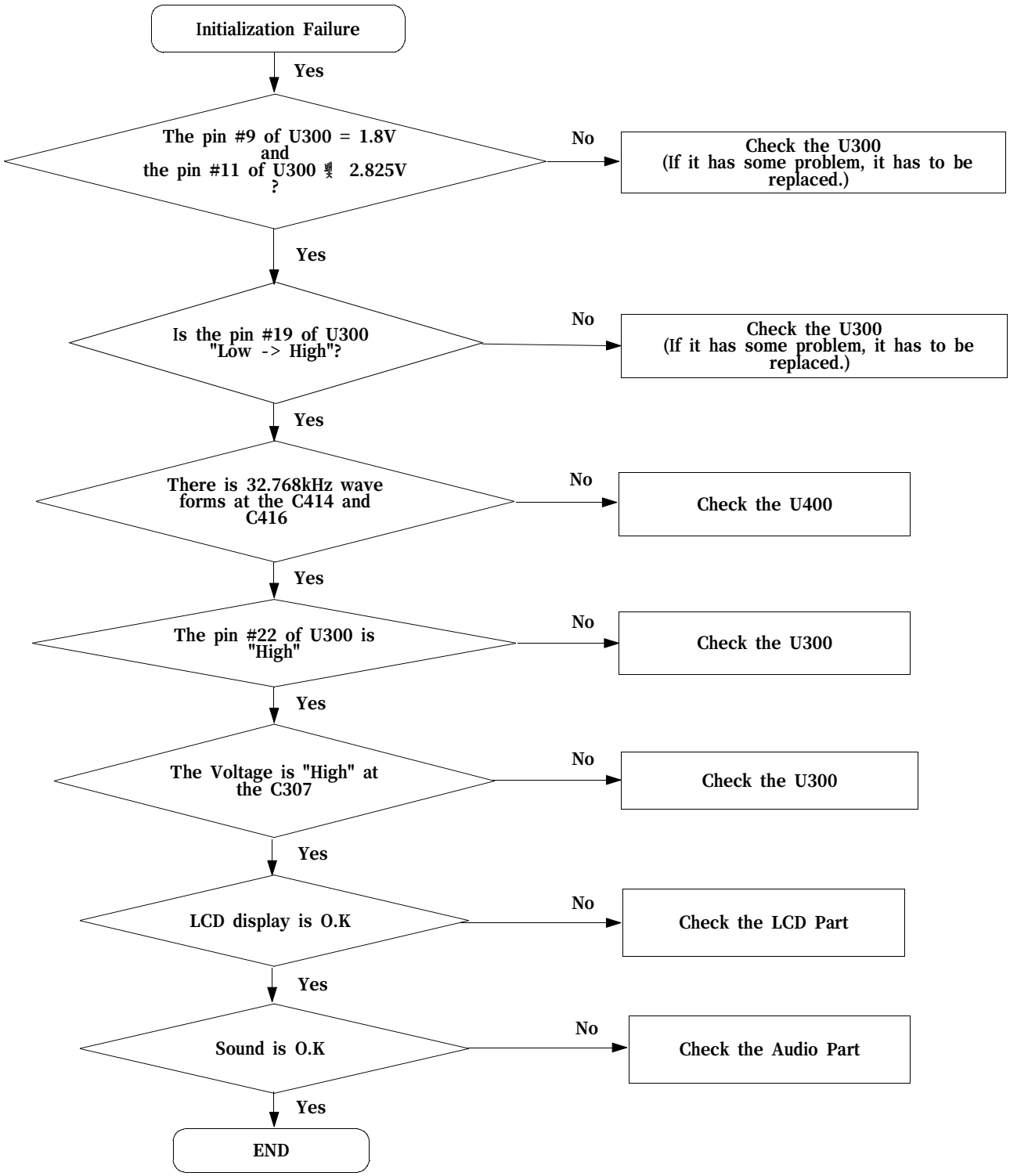
7. SGH-X430 Flow Chart of Troubleshooting

2. Initial



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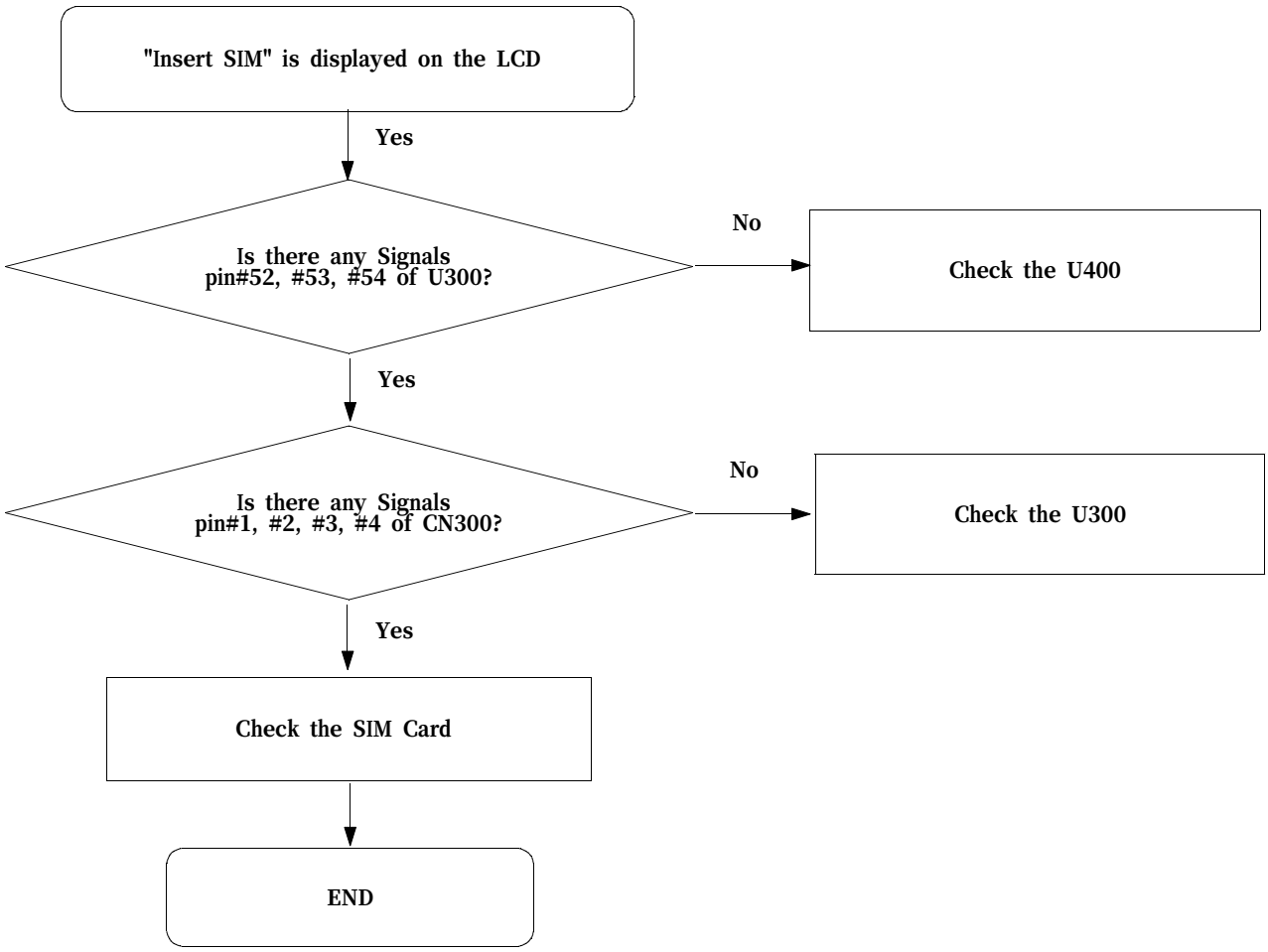
3. Sim Part



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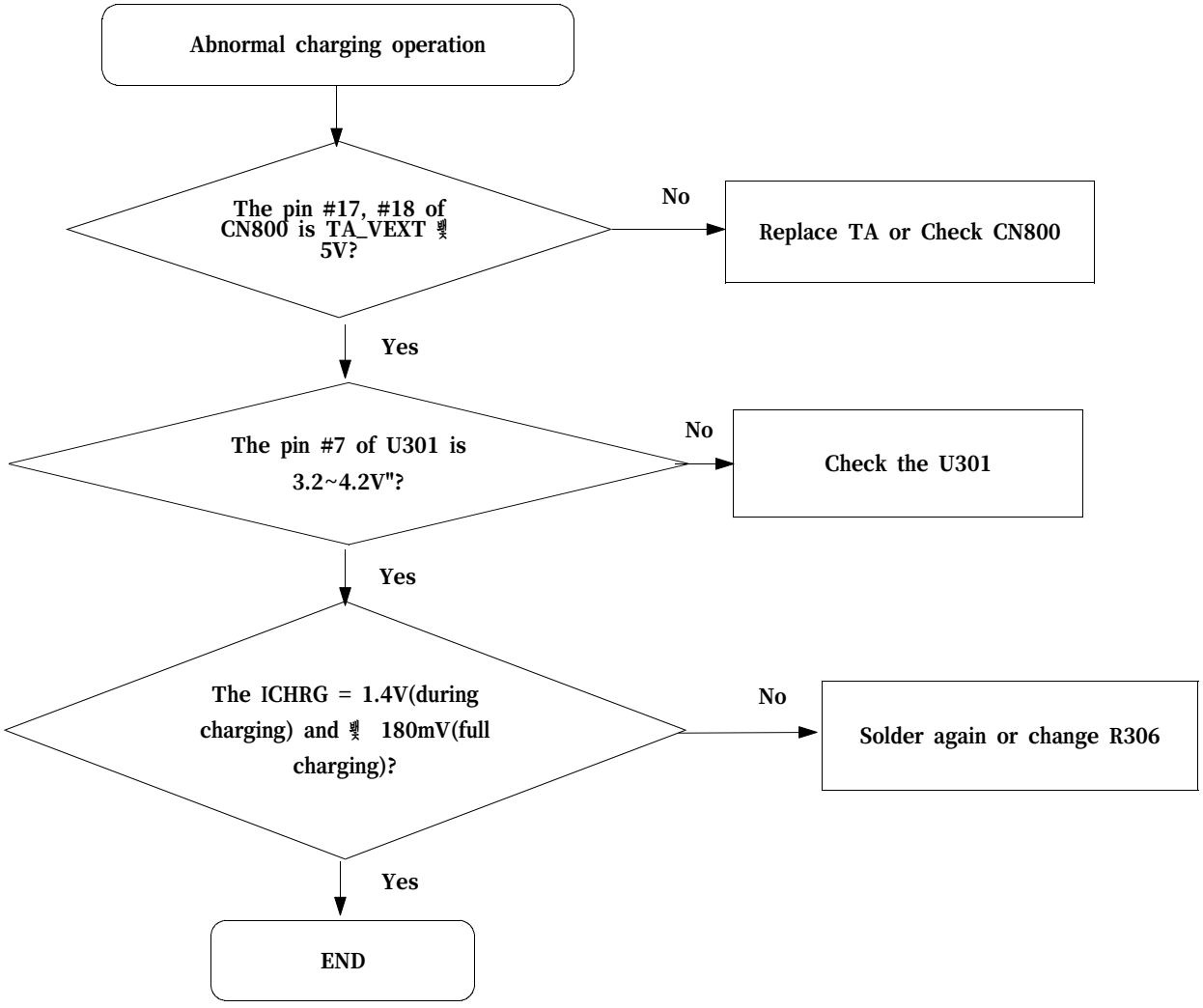
4. Charging Part



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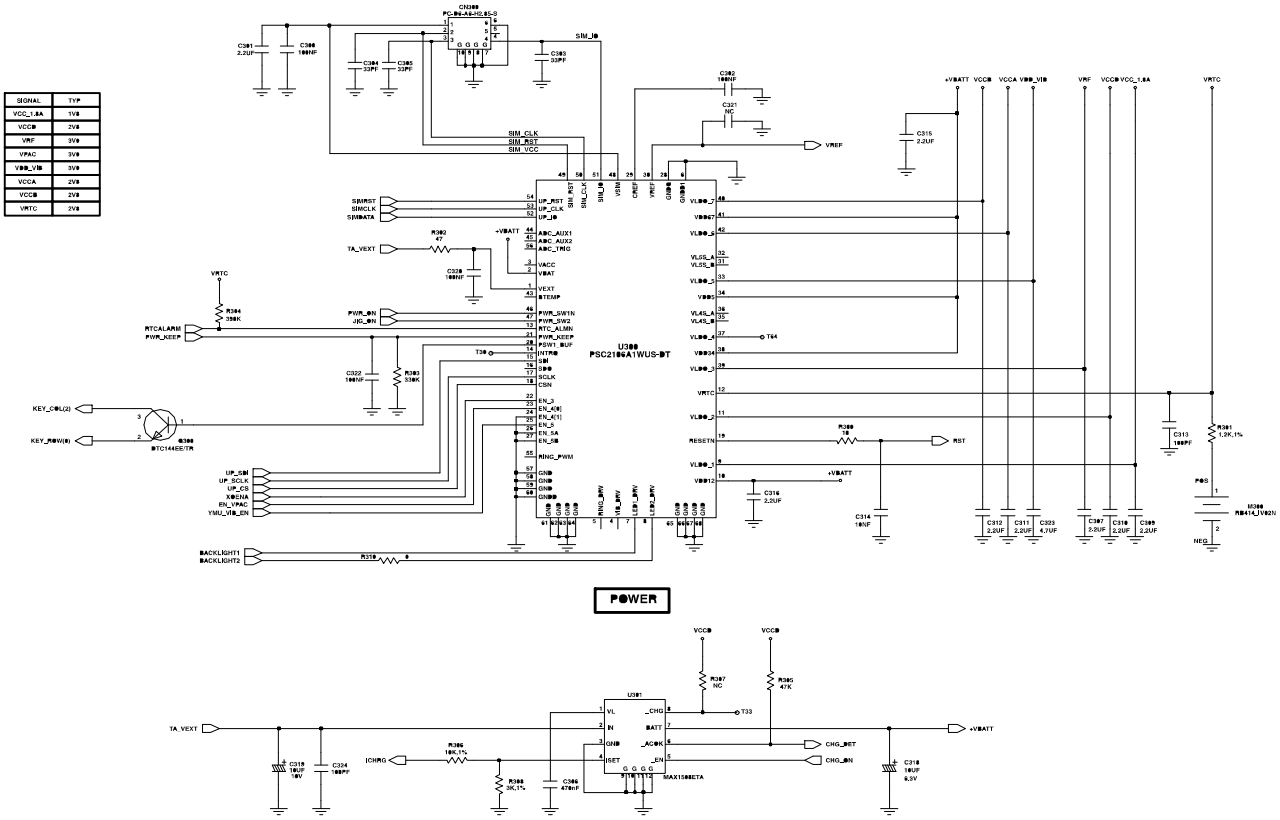
7. SGH-X430 Flow Chart of Troubleshooting



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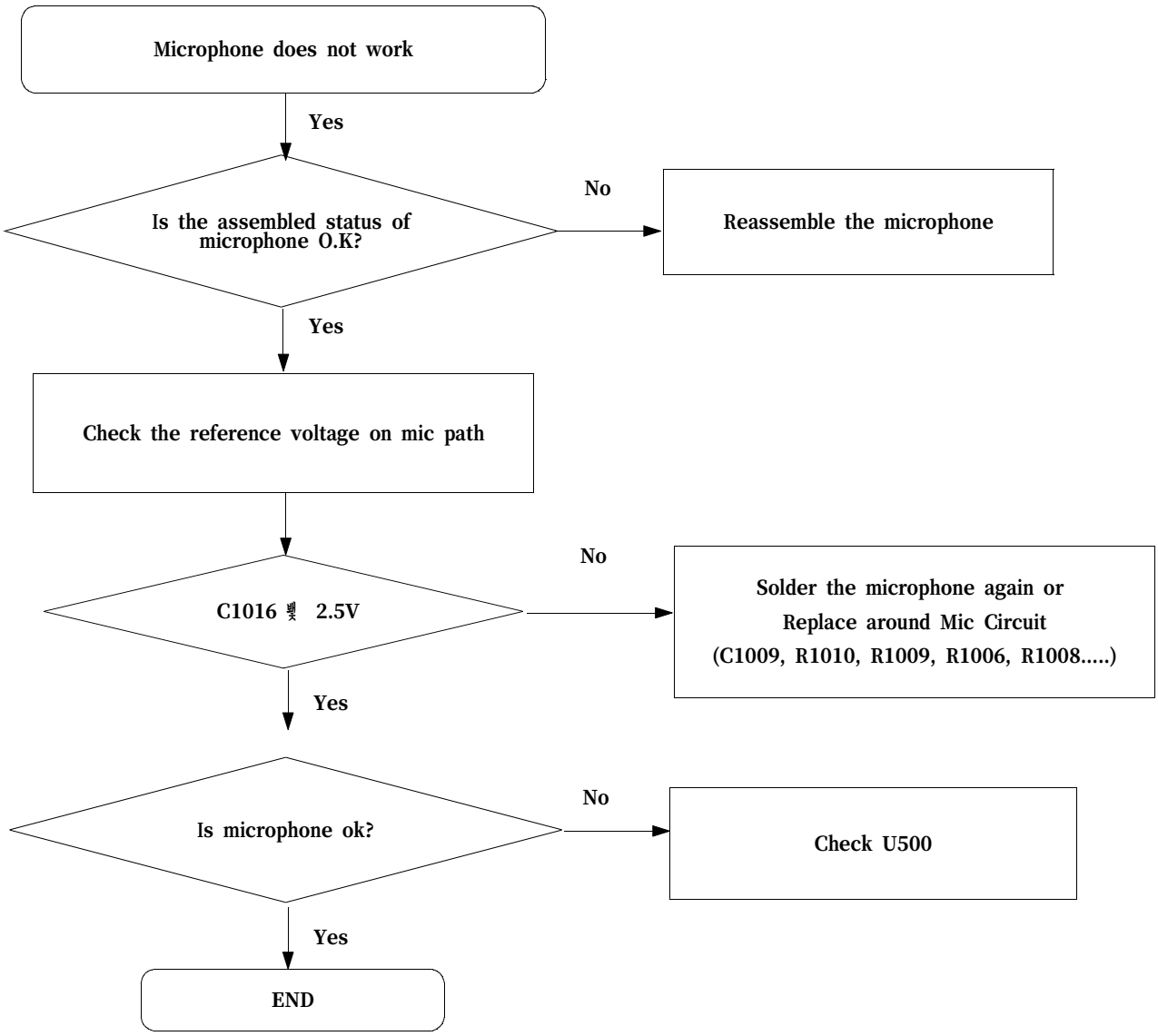
5. Microphone Part



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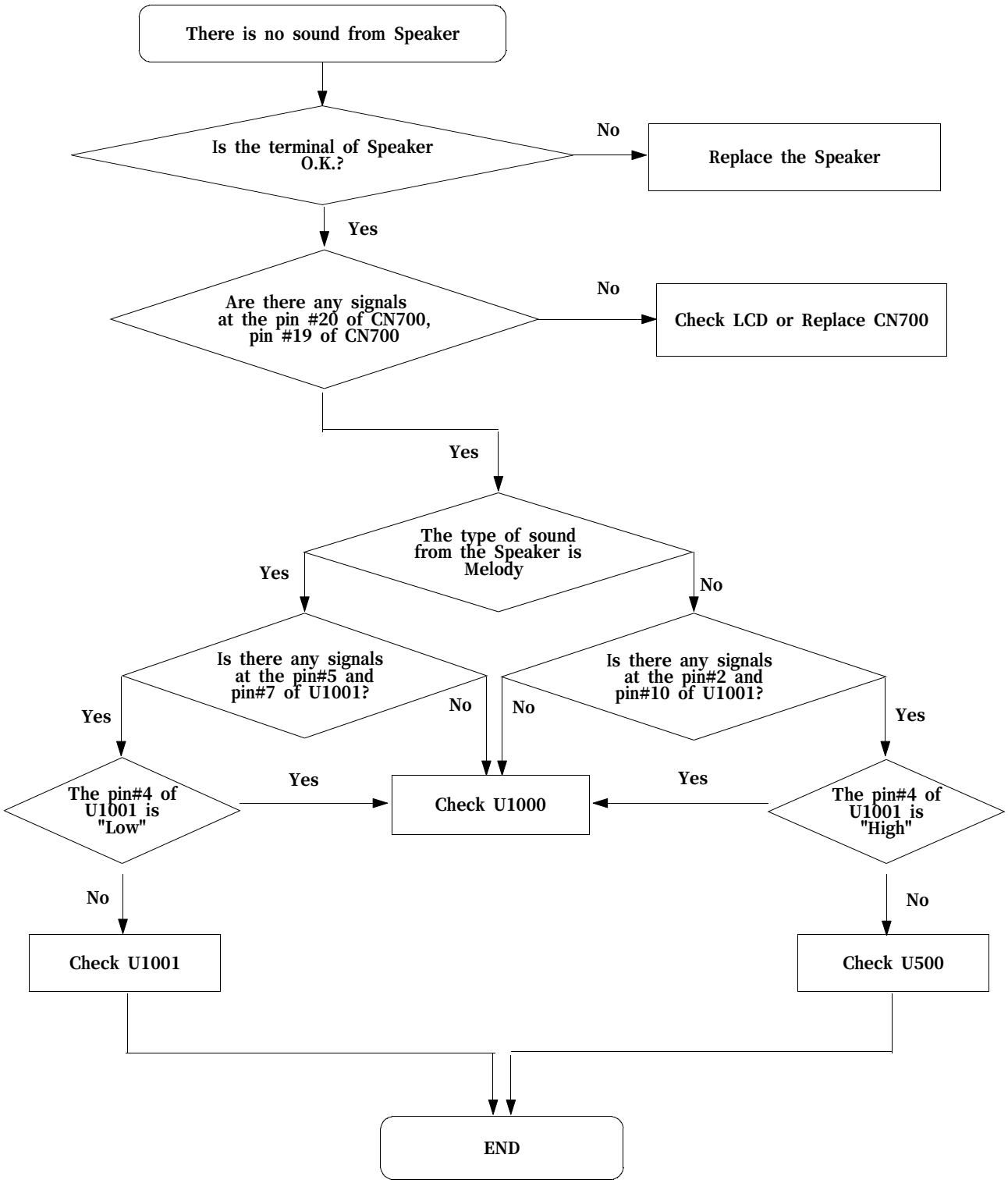
6. Speaker Part



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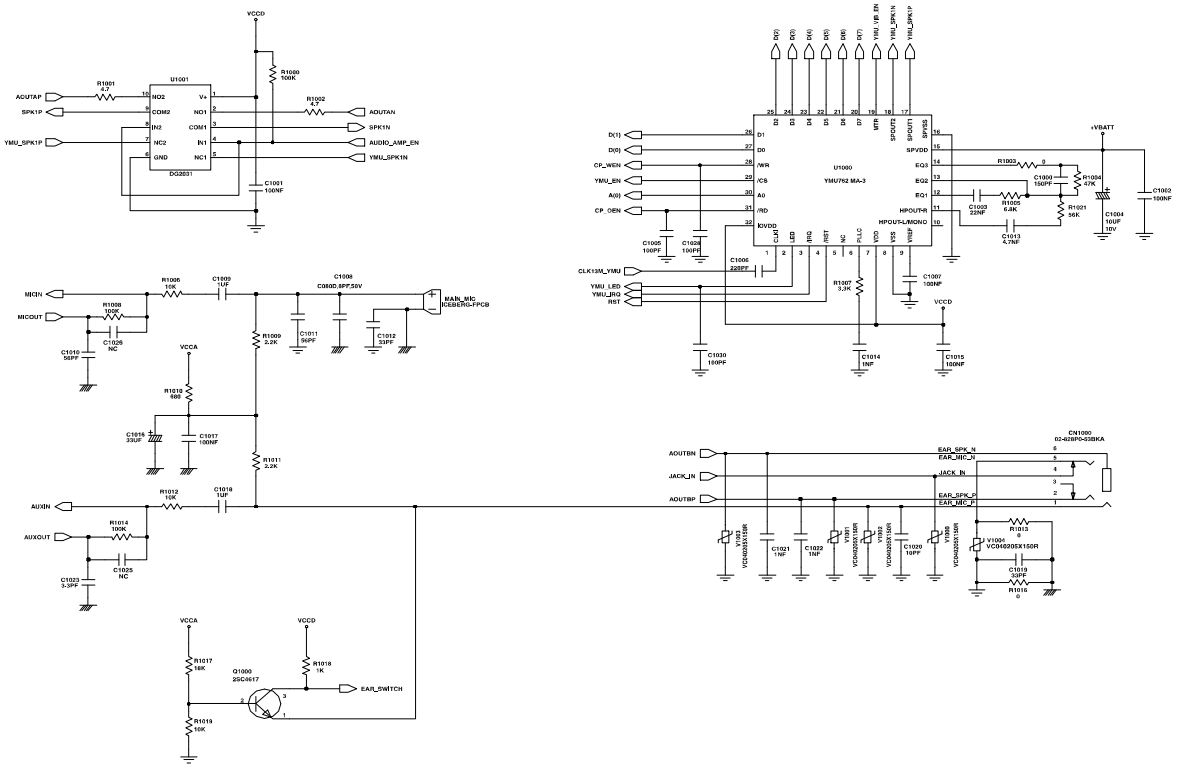
7. SGH-X430 Flow Chart of Troubleshooting



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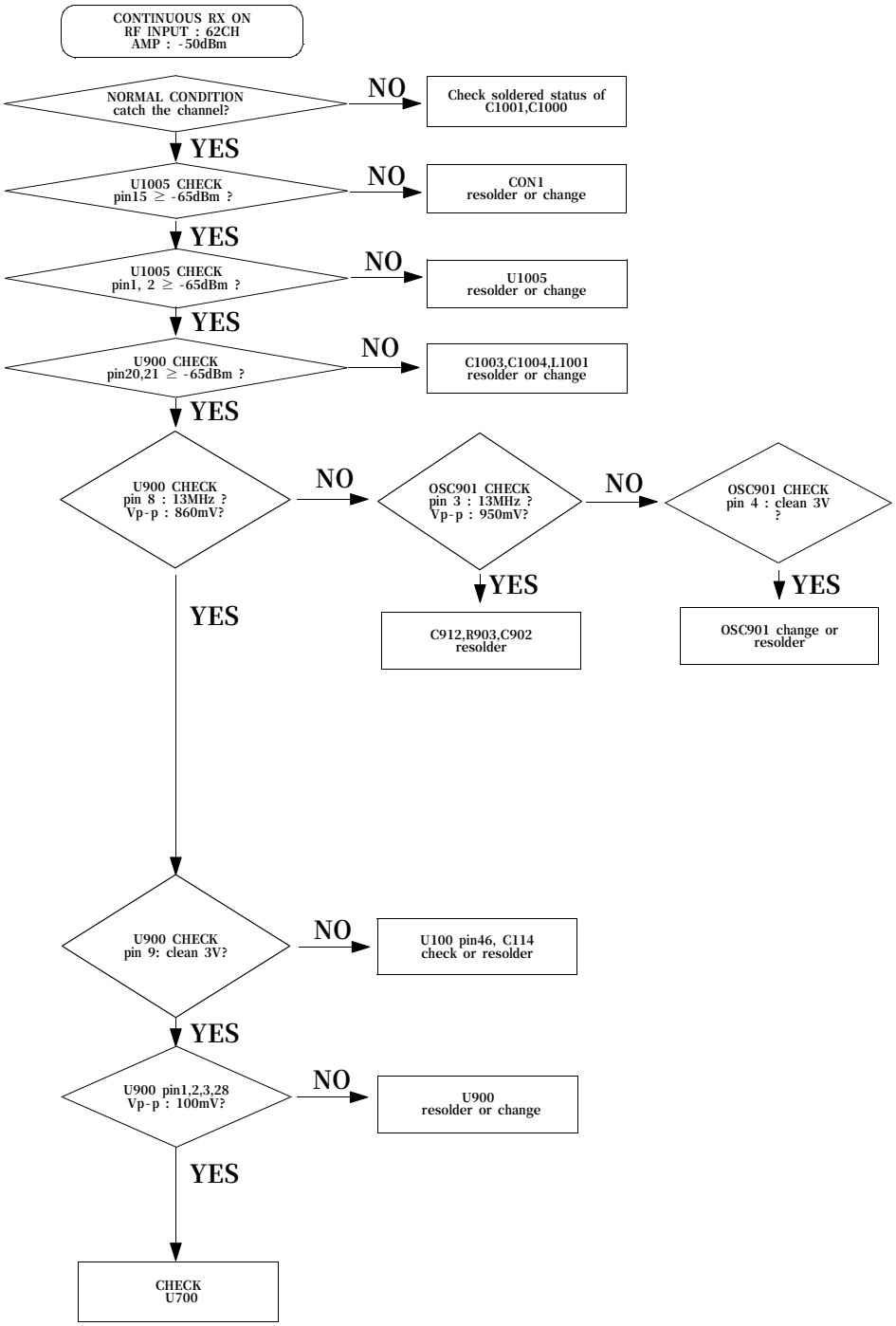
8. EGSM Receiver



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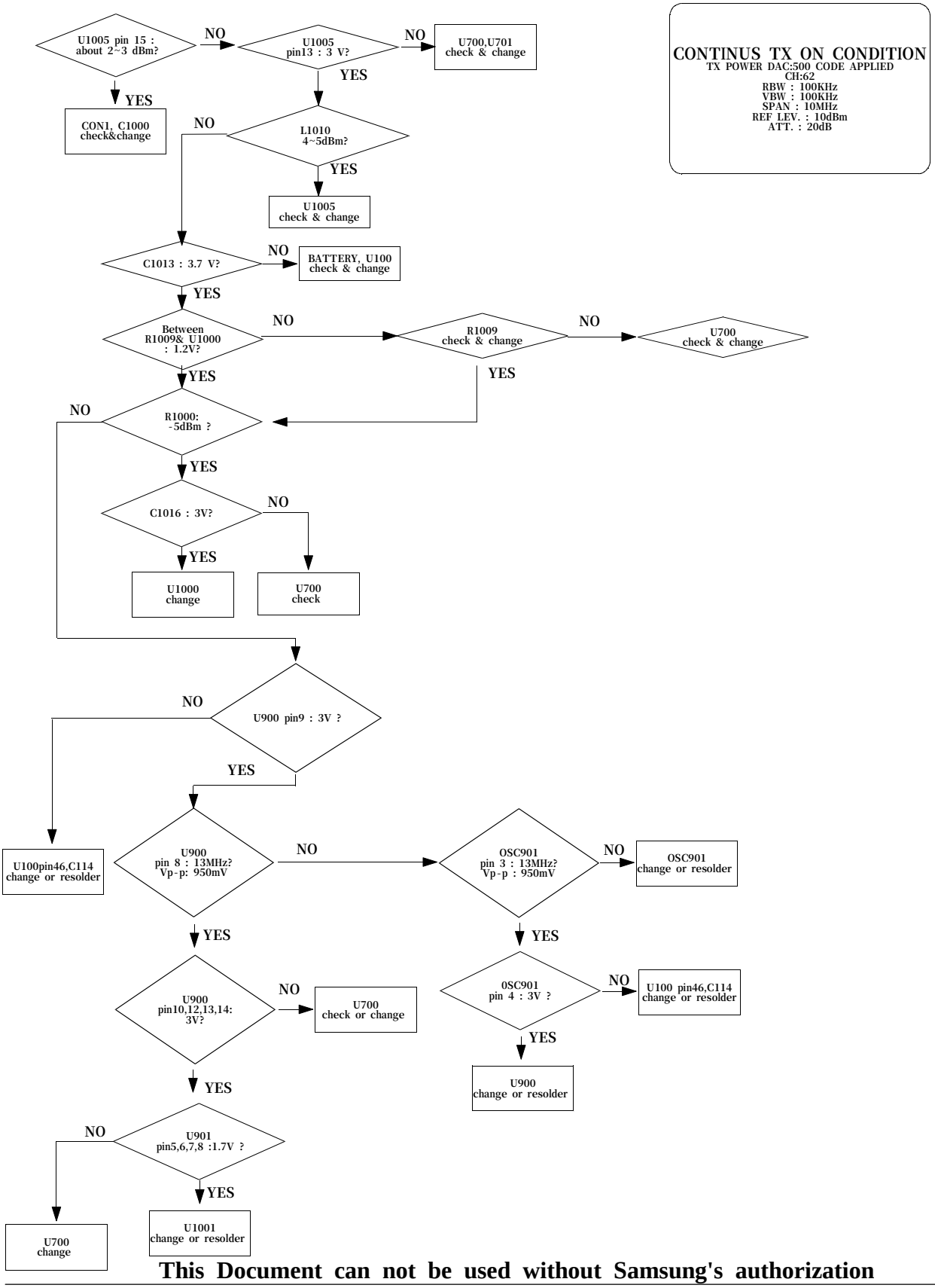
9. EGSM transmitter



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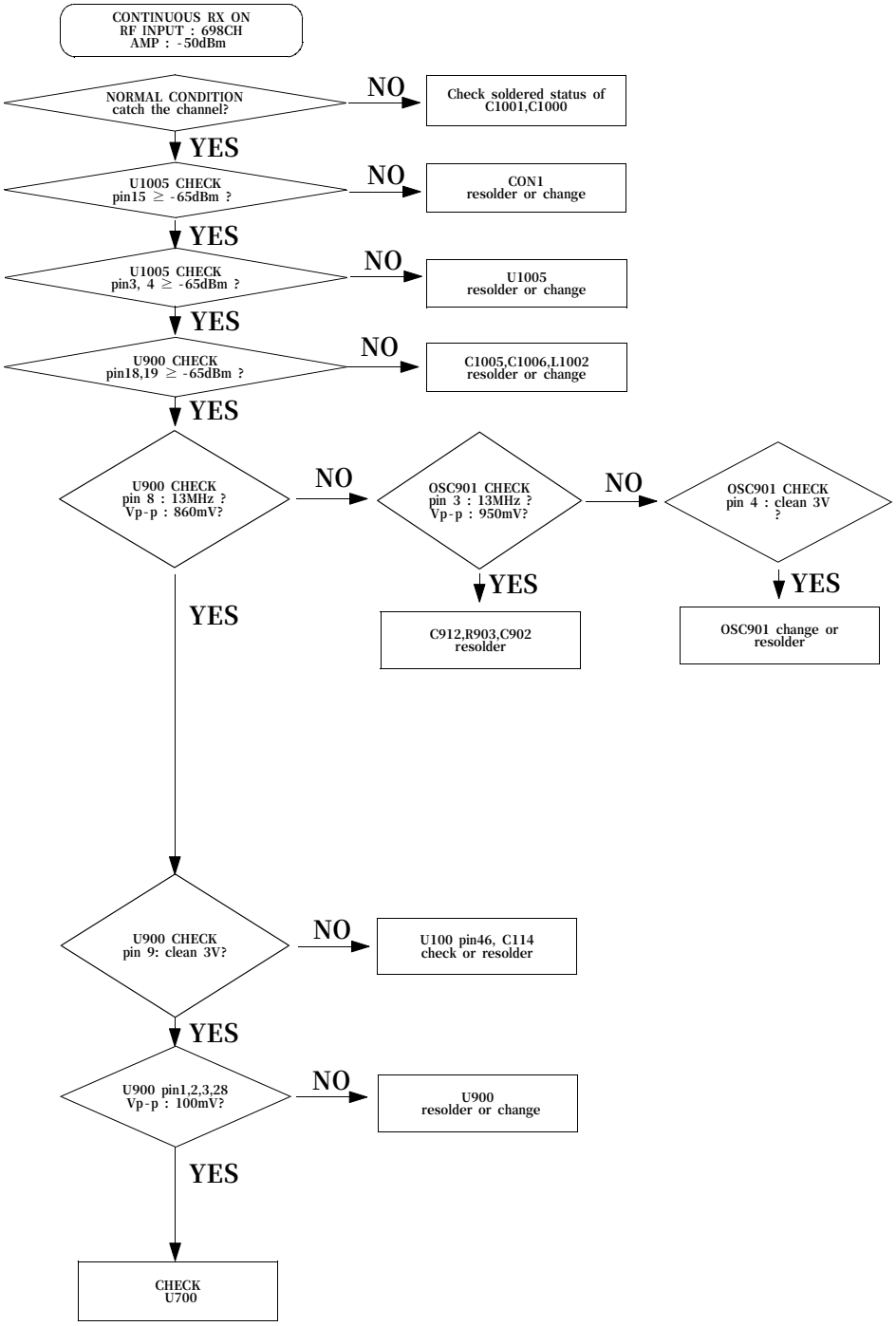
10. DCS Receiver



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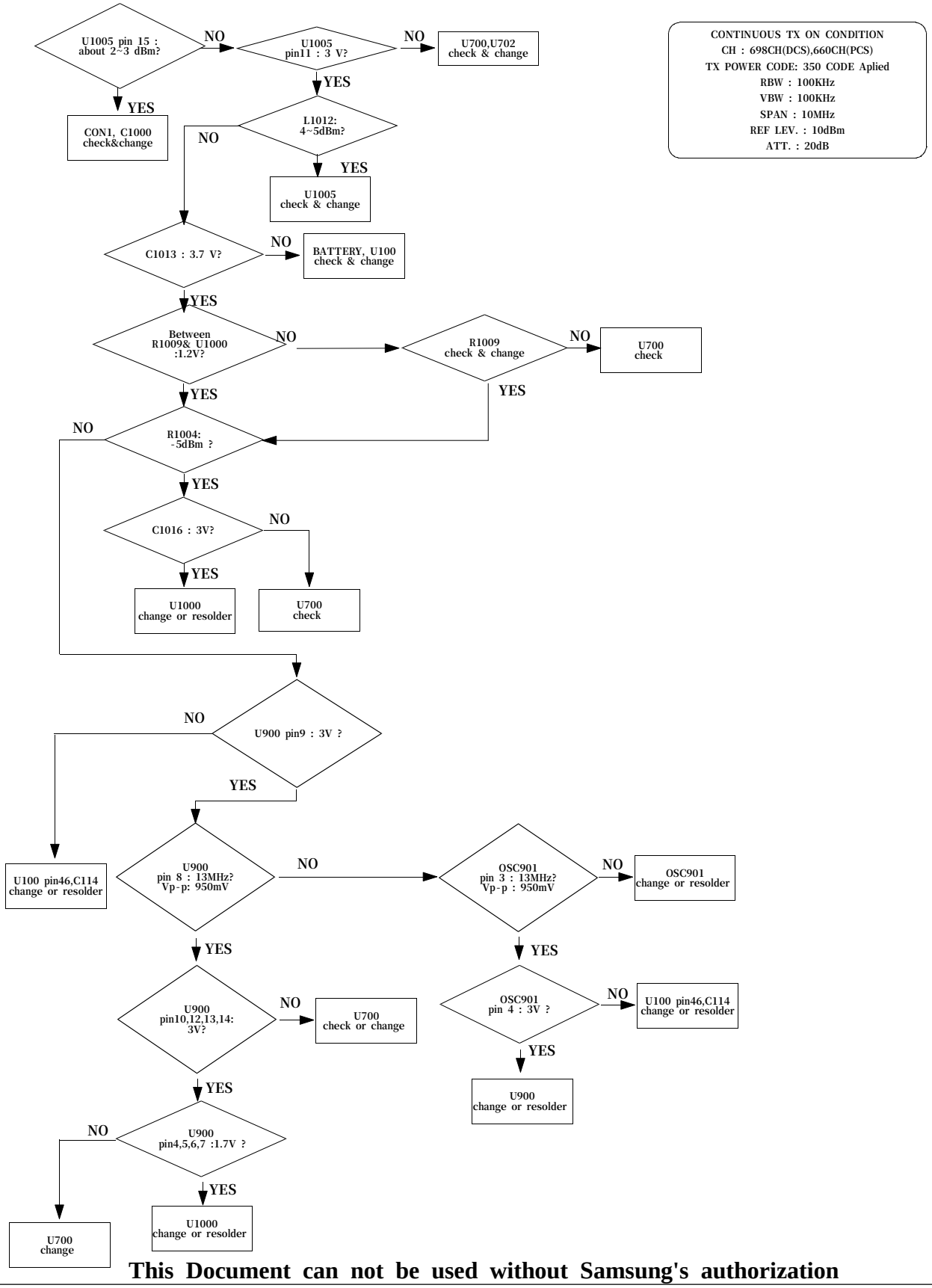
11. DCS transmitter



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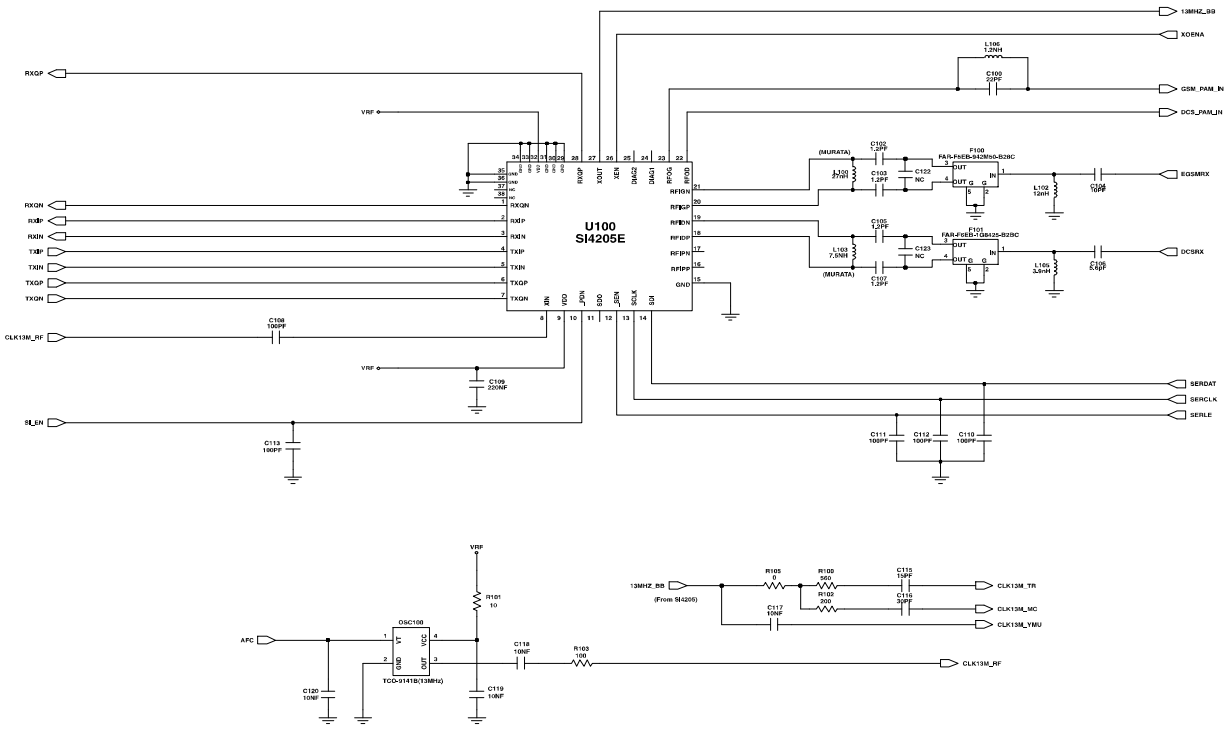
7. SGH-X430 Flow Chart of Troubleshooting



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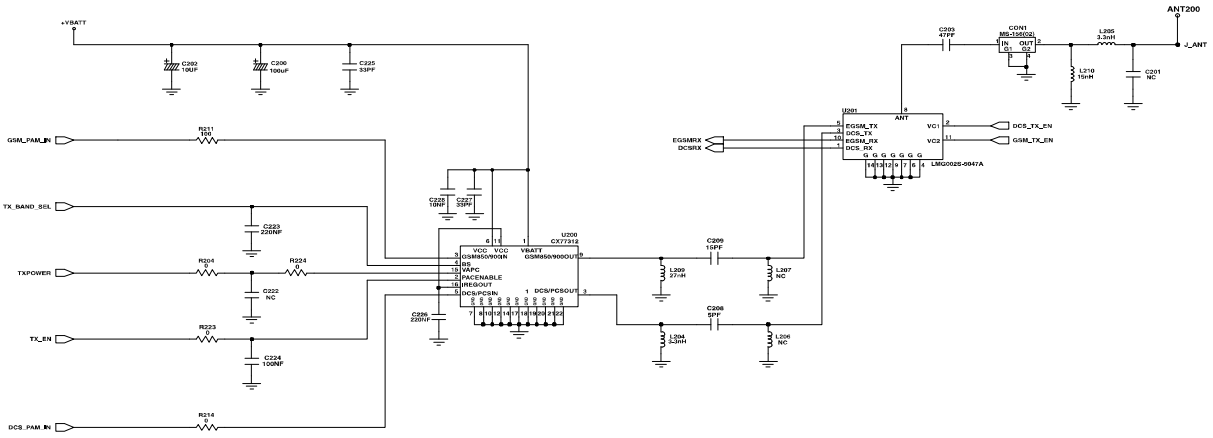
7. SGH-X430 Flow Chart of Troubleshooting



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